The problems in this review are designed to help prepare you for your upcoming exam. Questions pertain to material covered in the course and are intended to reflect the topics likely to appear in the exam. Keep in mind that this worksheet was created by CARE tutors, and while it is thorough, it is not comprehensive. In addition to exam review sessions, CARE also hosts regularly scheduled tutoring hours.

Tutors are available to answer questions, review problems, and help you feel prepared for your exam during these times:

Session 1: Sunday, September 18th 5p-7p: Ankit, Greg, and Sera
Session 2: Monday, September 19th 5:30p-7:3p: Olivia, Jonathan, and Sera

Can’t make it to a session? Here’s our schedule by course:

https://care.grainger.illinois.edu/tutoring/schedule-by-subject

Solutions will be available on our website after the last review session that we host.

Step-by-step login for exam review session:

1. Log into Queue @ Illinois: https://queue.illinois.edu/q/queue/902
2. Click “New Question”
3. Add your NetID and Name
4. Press “Add to Queue”

Please be sure to follow the above steps to add yourself to the Queue.

Good luck with your exam!
1. Calculate the following equations using the correct significant figure rules.

(a) \(0.008 + 0.42 - 0.041\)
(b) \(100.0 \times 47.830\)

2. Write the corresponding name/chemical formula for the following compounds:

(a) \(\text{H}_2\text{SO}_4\)
(b) \(\text{Ca}_3\text{P}_2\)
(c) Ammonium Chlorate
(d) Copper (II) Acetate
(e) Tetraphosphorus Hexoxide

3. Draw the corresponding Lewis structures for the following compounds:

I. HCN
II. \(\text{CO}_2\)
III. AsF\(_5\)
4. Which of the following statements regarding the Lewis structure below are FALSE?

\[
\begin{array}{cccccccc}
:O: & & & H \\
\H & C_1 & C_2 & C_3 & C_4 & \cdash N & H \\
\H & 1 & 2 & 3 & & & 4 & H & H
\end{array}
\]

A) An sp\(^2\) hybrid orbital from C-1 overlaps with an sp hybrid orbital from C-2 to form the sigma bond between C-1 and C-2.
B) This molecule has three \(\pi\) bonds.
C) Two of the atoms in this compound are sp\(^3\) hybridized.
D) The \(\pi\) bonds between C-2 and C-3 are formed from overlap of sp hybrid orbitals.
E) There are 10 sigma bonds in this molecule.

5. Write the electron configuration for the following elements in shorthand notation:

(a) O  (b) Pb  (c) K  (d) Ce  (e) Rn  (f) Cu  (g) Mn

6. Answer the following questions about periodic trends.

(a) Rank from smallest to largest atomic radii: Li, O, Fr, Rb, He
(b) Which has a higher ionization energy, Boron or Beryllium?
(c) Rank from most to least ionization energy: P, As, Te, O
(d) Rank from smallest to largest atomic radii: Na\(^+\), O\(^2-\), F\(^-\), Mg\(^+\)
7. Balance the following equation.

\[ C_8H_{18} + \_\_\_\_\_\_O_2 \rightarrow \_\_\_\_\_\_CO_2 + \_\_\_\_\_\_H_2O \]

8. Circle the following ions that have 2 unpaired electrons in ground state.

Cu\(^+\)  Ni\(^{2+}\)  Zn\(^{2+}\)  Cr\(^{2+}\)  Ti\(^{2+}\)

9. Which bond has the shortest bond length and give an explanation as to why?

A) Single  
B) Double Bond  
C) Triple Bond

10. How many of the following processes are examples of a chemical change?

(I) \(H_2O\ (l) \rightarrow H_2O\ (g)\)
(II) \(I_2\ (s) \rightarrow I_2\ (g)\)
(III) \(CH_4\ (g) + 2O_2\ (g) \rightarrow CO_2\ (g) + 2H_2O\ (l)\)
(IV) \(C_6H_{12}O_6(s) \rightarrow C_6H_{12}O_6(aq)\)
(V) \(2H_2O_2(aq) \rightarrow 2H_2O(l) + O_2(g)\)

A) 1  
B) 2  
C) 3  
D) 4  
E) 5
11. For a hydrogen atom, how many of the following three electronic transitions are exothermic? Circle them.

A) n = 6 to n = 1  
B) n = 2 to n = 3  
C) n = 3 to n = 5

12. When an electron in a 2p orbital of a lithium atom makes a transition to the 2s orbital, a photon of wavelength 670.8 nm is emitted. Calculate the energy difference between the 2p and 2s orbitals in lithium.

13. Calculate the change in energy for the n = 4 to the n = 2 transition in hydrogen.

14. Does a visible light (λ = 400 - 700 nm) photon have enough energy to excite a H electron from n=1 energy to n = 6 energy state?

15. Calculate the mass percent composition of the following compound

C₃H₄O₂